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30 August 1999

Mr. Jim F. Snyder
Remediation Program Manager
HQ AFCEE/MMR
322 E. Inner Road, Box 41
Otis ANGB, MA 02542-5028

SUBJECT: Contract F41624-97-D-8006
MMR Plume Response Program
DO 0011 DCN/Proj #AFC-J23-35S18501-M7-0035
Final Soil Sampling at the CS-16 and CS-17 Source Areas

Dear Mr. Snyder:

This letter and attachment finalize the draft Soil Sampling at the CS-16/17 Source Areas and reports on the field findings and analytical results of surface and subsurface soil sampling conducted from 27 October to 6 November 1998 at the CS-16 and CS-17 source areas. This soil sampling program is specified in the 29 September 1998 document: the *Streamlined Sampling and Analysis Plan for the CS-10, CS-16/17, & LF-4 Source Areas, Groundwater Sentry Well Monitoring at the Public Water Supply J Well, and Air Sampling at the Quashnet River Area of FS-1*, as amended by the 18 November 1998 Memorandum of Resolution. AFCEE is the author of both reports, which were prepared by Jacobs Engineering Group Inc.

Twenty surface and eight subsurface soil samples were collected from CS-16 (former sludge drying beds) and 30 surface and six subsurface soil samples were collected from CS-17 (former sludge disposal area). The soil samples were collected according to the procedures in MMR TECH-021, Soil Sampling, of the *Quality Program Plan*. The surface soil samples were sent to a subcontract analytical laboratory for select metals (arsenic, cadmium, chromium, copper, mercury, lead and zinc) analyses by EPA method ILM04.0 and pesticide/PCB analyses by EPA method ILM03.1. In addition, subsurface soil samples were collected using Encore samplers (EPA method SW-5035) and submitted for volatile organic compound (VOC) analysis by EPA method SW-8260. The samples were preserved at the laboratory in accordance with the methods and were analyzed for low-level VOCs.

A remedial investigation/feasibility study, proposed plan, and record of decision have been written for CS-16/17. According to the proposed plan, the soil from these areas will be excavated and stabilized on base using asphalt batching methods. However, during the feasibility study, it was determined that some portions of the drying beds had been disturbed during the demolition of the walls that separate the beds. As a result, the U.S.





Environmental Protection Agency has requested additional sampling to verify previous results and to further characterize the beds to assist with the excavation plan.

Analytical data from this soil sampling event were compared to soil target cleanup levels (STCLs) distributed by the Hazardous Wastes Remedial Action Program (HAZWRAP) for the Drainage Structure Removal Program (DSRP). Twenty-six of the soil sampling locations reported exceedances above STCLs for pesticides/PCBs and/or total metals. These results are presented in Table 3 of Attachment B.

This transmittal includes the following attachments:

A – Figure 1, Chemical Spill-16/17 (CS-16/17) Sampling Points

B – Table 1, Field Measurements Collected During CS-16/17 Surface and Subsurface Soil Sampling
Table 2, Field Conditions and Schedule of Sampling
Table 3, Analytical Results of Surface and Subsurface Soil Sampling At CS-16/17

C – Data Summary Report, CS-16/17 Source Areas

Please feel free to contact me or Earl Parker at (423) 220-4127 if you have any questions or comments.

Sincerely,

Eric W. Banks, P. E.
Program Manager

EWB/abp

Enclosures:
Document (23 copies & 1 EDD)

C:		
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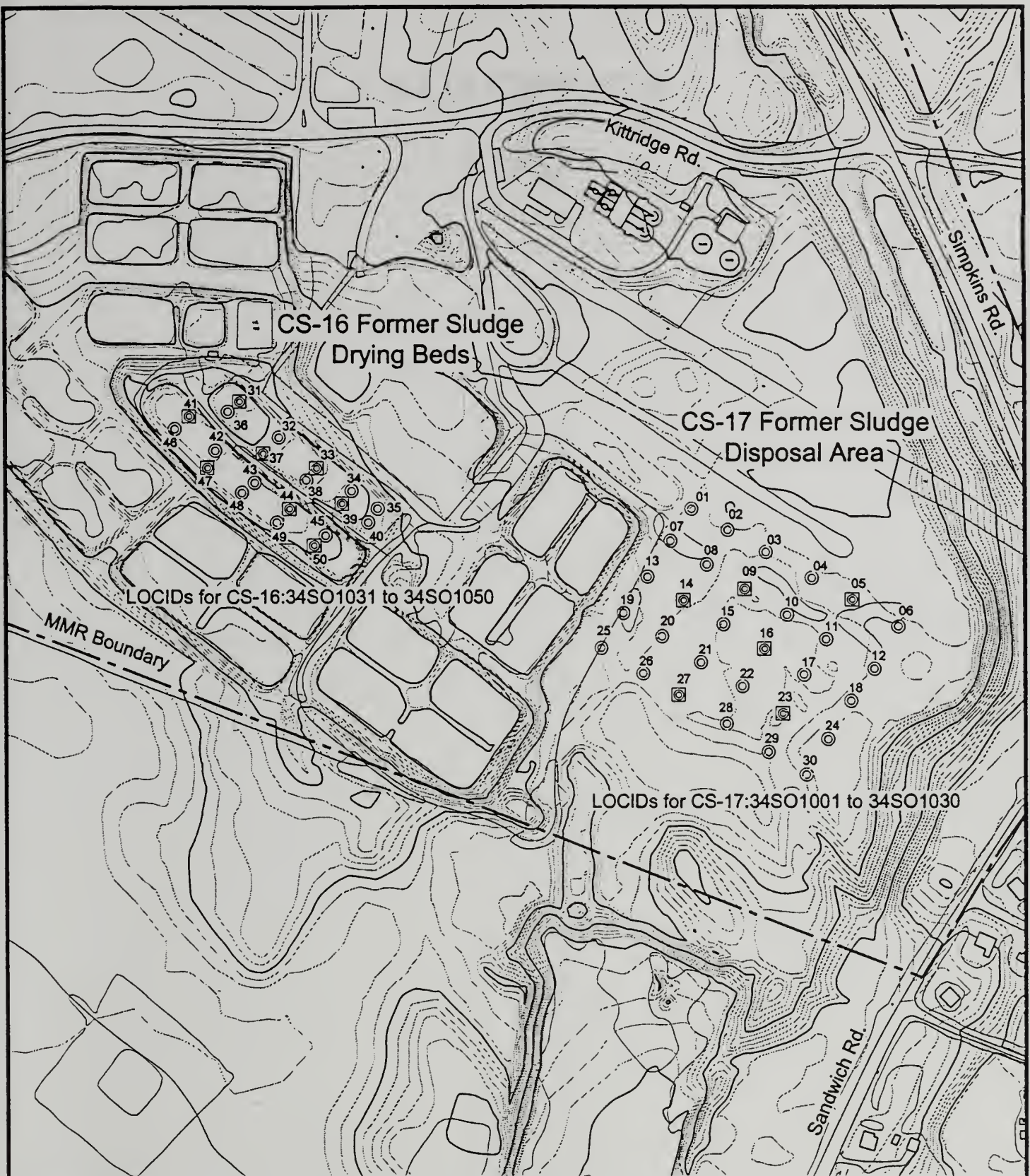
ATTACHMENT A

FIGURE

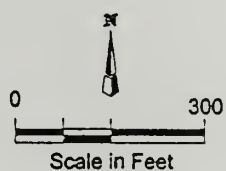


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**Legend**

- Surface Soil Sampling Point
- ⊗ Subsurface Soil Sampling Point
- MMR Boundary
- Location Identification: 34SO10__



JACOBS ENGINEERING

Chemical Spill - 16/17 Sampling Points

Massachusetts Military Reservation
Cape Cod, Massachusetts

ATTACHMENT B

TABLES

1. *Introduction*

2. *Methodology*

ATTACHMENT B

Table 1
Field Measurements Collected During
CS-16/17 Surface and Subsurface Soil Sampling

CS-16 LOCID	Surface Soil				Subsurface Soil			
	Date Sampled	Sampling Depth	Headspace Reading	Field Instrument	Date Sampled	Sampling Depth	Headspace Reading	Field Instrument
34SO1031	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID	10/29/1998	5.0' - 5.5'	0.0	Photovac microFID
34SO1032	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1033	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID	10/29/1998	5.0' - 5.5'	0.5	Photovac microFID
34SO1034	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1035	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1036	10/27/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1037	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	10/29/1998	5.0' - 5.5'	0.0	Photovac microFID
34SO1038	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1039	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	10/29/1998	5.0' - 5.5'	0.8	Photovac microFID
34SO1040	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1041	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	11/02/1998	5.0' - 5.5'	0.0	Photovac Model PID
34SO1042	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1043	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1044	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	11/02/1998	5.0' - 5.5'	0.0	Photovac Model PID
34SO1045	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1046	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1047	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	11/02/1998	5.0' - 5.5'	0.0	Photovac Model PID
34SO1048	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1049	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID				
34SO1050	10/28/1998	0.5' - 1.0'	0.0	Photovac Model PID	11/02/1998	5.0' - 5.5'	1.8	Photovac Model PID

CS-17 LOCID	Surface Soil				Subsurface Soil			
	Date Sampled	Sampling Depth	Headspace Reading	Field Instrument	Date Sampled	Sampling Depth	Headspace Reading	Field Instrument
34SO1001	11/03/1998	0.5' - 1.0'	14.1	Photovac microFID				
34SO1002	11/03/1998	0.5' - 1.0'	13.2	Photovac microFID				
34SO1003	11/03/1998	0.5' - 1.0'	20.9	Photovac microFID				
34SO1004	11/03/1998	0.5' - 1.0'	37.9	Photovac microFID				
34SO1005	11/03/1998	0.5' - 1.0'	17.8	Photovac microFID	11/05/1998	5.0' - 5.5'	3.0	Photovac Model PID
34SO1006	11/03/1998	0.5' - 1.0'	7.6	Photovac microFID				
34SO1007	11/03/1998	0.5' - 1.0'	45.4	Photovac microFID				
34SO1008	11/03/1998	0.5' - 1.0'	32.5	Photovac microFID				
34SO1009	11/03/1998	0.5' - 1.0'	92.0	Photovac microFID	11/05/1998	4.5' - 5.0'	0.0	Photovac Model PID
34SO1010	11/03/1998	0.5' - 1.0'	1.2	Photovac microFID				
34SO1011	11/03/1998	0.5' - 1.0'	1.1	Photovac microFID				
34SO1012	11/03/1998	0.5' - 1.0'	7.9	Photovac microFID				
34SO1013	11/04/1998	0.5' - 1.0'	9.0	Foxboro Model OVA				
34SO1014	11/04/1998	0.5' - 1.0'	11.0	Foxboro Model OVA	11/05/1998	3.5' - 4.0'	0.8	Photovac Model PID
34SO1015	11/04/1998	0.5' - 1.0'	3.0	Foxboro Model OVA				
34SO1016	11/05/1998	0.5' - 1.0'	0.6	Photovac Model PID	11/06/1998	5.0' - 5.5'	19.0	Photovac Model PID
34SO1017	11/05/1998	0.5' - 1.0'	3.0	Photovac Model PID				
34SO1018	11/05/1998	0.5' - 1.0'	0.3	Photovac Model PID				
34SO1019	11/04/1998	0.5' - 1.0'	9.0	Foxboro Model OVA				
34SO1020	11/04/1998	0.5' - 1.0'	9.0	Foxboro Model OVA				
34SO1021	11/04/1998	0.5' - 1.0'	24.0	Foxboro Model OVA				
34SO1022	11/04/1998	0.5' - 1.0'	1.0	Foxboro Model OVA				
34SO1023	11/04/1998	0.5' - 1.0'	2.0	Foxboro Model OVA	11/06/1998	5.0' - 5.5'	10.0	Photovac Model PID
34SO1024	11/04/1998	0.5' - 1.0'	0.0	Foxboro Model OVA				
34SO1025	11/04/1998	0.5' - 1.0'	0.0	Foxboro Model OVA				
34SO1026	11/04/1998	0.5' - 1.0'	0.5	Foxboro Model OVA				
34SO1027	11/04/1998	0.5' - 1.0'	0.5	Foxboro Model OVA	11/06/1998	5.0' - 5.5'	32.0	Photovac Model PID
34SO1028	11/04/1998	0.5' - 1.0'	0.0	Foxboro Model OVA				
34SO1029	11/04/1998	0.5' - 1.0'	0.0	Foxboro Model OVA				
34SO1030	11/04/1998	0.5' - 1.0'	0.0	Foxboro Model OVA				

NOTE: Air monitoring and headspace readings measured in parts per million.
Sampling depth measured in feet below ground surface.

ATTACHMENT B

Table 2
Field Conditions and Schedule of
CS-16/17 Surface and Subsurface Soil Sampling

Date	Day	Locations Sampled	Weather Conditions
10/27/1998	Tuesday	(Surface) 34SO1031 - 36	Sunny, clear, calm, temp in 50s
10/28/1998	Wednesday	(Surface) 34SO1037 - 50	Partly cloudy, calm, temp in 50s
10/29/1998	Thursday	(Subsurface) 34SO1031, 33, 37, 39	Sunny, clear, breezy, temp in 50s
11/02/1998	Monday	(Subsurface) 34SO1041, 44, 47, 50	Sunny, clear, temp in 40s
11/03/1998	Tuesday	(Surface) 34SO1001-12	Partly cloudy, calm, temp in 50s
11/04/1998	Wednesday	(Surface) 34SO1013-15, 19-30	Overcast, calm, temp in low 40s
11/05/1998	Thursday	(Surface) 34SO1016-18 & (Subsurface) 34SO1005, 09, 14	Sunny, breezy, temp in 40s
11/06/1998	Friday	(Subsurface) 34SO1016, 23, 27	Sunny, breezy, temp in 40s

ATTACHMENT B

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

Site	Reporting Limit	Soil Target Cleanup Levels (STCL)	34SO1001 (0.5-1)	34SO1002 (0.5-1)	34SO1003 (0.5-1)	34SO1004 (0.5-1)	34SO1005 (0.5-1)	34SO1006 (0.5-1)	34SO1007 (0.5-1)	34SO1008 (0.5-1)	34SO1008FD (0.5-1)	34SO1009 (0.5-1)	34SO1009 (4.5-5.0)
Date Sampled			11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/03/1998	11/05/1998
Pesticide/PCBs	(µg/kg)	(µg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-BHC	1.7	203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
b-BHC	1.7	78.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
d-BHC	1.7	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-BHC (lindane)	1.7	224	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	1.7	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1.7	235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	1.7	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	3.3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	3.3	227	1.8 J	13	ND	ND	ND	ND	ND	ND	4.7 J	ND	ND
Endrin	3.3	15.6	ND	ND	ND	ND	ND	ND	ND	ND	3.9 J	ND	ND
Endosulfan II	3.3	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	3.3	2410	ND	5.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	3.3	250	1.6 J	26	1.3 J	ND	1.6 J	ND	1.9 J	ND	12 J	ND	ND
Methoxychlor	17	12500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-Chlordane	1.7	1000	ND	ND	ND	ND	ND	ND	ND	ND	7.8 J	ND	ND
γ-Chlordane	1.7	87.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	170	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	67	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	33	158	ND	ND	ND	ND	ND	ND	ND	ND	250 J	ND	ND
Aroclor 1260	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TAL Metals	(mg/kg)	(mg/kg)											
Arsenic	2.0	3.6	3.8	2.1	3.1	2.3	1.6	1.5	2.1	2.4	1.5 J	1.3 J	0.91 J
Cadmium	1.0	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	2.0	6.8	13.3	5.1	8.8	6.2	4.7	5.3	6.0	8.4	7.3	3.8	4.8
Copper	5.0	19.3	2.1 J	3.6 J	3.4 J	2.8 J	2.8 J	2.5 J	9.0	18.2	16.7	26 J	2.7 J
Lead	0.6	15.8	8	6.8	7.7	4.6	4.4	3.6	25.4	48.1	45.4	6	2.2
Mercury	0.1	1.5	ND	ND	ND	ND	ND	ND	0.68	3.3	2.4	0.04 J	0.03 J
Zinc	4.1	16.0	13.7	15.9	14.5	14.9	11.1	9.5	13.4	16	15.8	14.2	12.7
VOCs	(µg/kg)	(µg/kg)											
Acetone	20	6250	---	---	---	---	---	56	---	---	---	---	37
Chloroform	5	100	---	---	---	---	---	8.4	---	---	---	---	ND
Triethylene Chloride	5	10	---	---	---	---	---	5.2 J	---	---	---	---	5 J

J = Estimated value
 ND = Analyte sampled for but not detected
 BOLD = Concentrations exceeding STCLs for clean fill
 "..." = Sample not collected at this location

ATTACHMENT B

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

Site	Reporting Limit	Soil Target Cleanup Levels (STCL)	CS-17 11/03/1998	CS-17 11/03/1998	CS-17 11/03/1998	CS-17 11/04/1998	CS-17 11/04/1998	CS-17 11/05/1998	CS-17 11/05/1998	CS-17 11/04/1998	CS-17 11/04/1998	CS-17 11/05/1998	CS-17 11/05/1998	CS-17 11/08/1998	CS-17 11/05/1998	CS-17 11/05/1998
Pesticide/PCBs	(µg/kg)	(µg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-BHC	1.7	203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
γ-BHC	1.7	78.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
δ-BHC	1.7	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
γ-BHC (lindane)	1.7	224	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	1.7	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1.7	235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	1.7	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	3.3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	3.3	227	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	3.3	15.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	3.3	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	3.3	2410	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	3.3	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Melchiorchlor	17	12500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-Chlordane	1.7	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
γ-Chlordane	1.7	87.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	170	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	67	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TAL Metals	(mg/kg)	(mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	20	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	1.0	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	2.0	6.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.6	19.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.1	15.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.1	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	4.1	16.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VOCs	(µg/kg)	(µg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	20	6250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	5	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	5	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

J = Estimated value
ND = Analyte sampled for but not detected
BOLD = Concentrations exceeding STCLs for clean fill
'...' = Sample not collected at this location

ATTACHMENT B

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

	Reporting Limit	Soil Target Cleanup Levels (STCL)	QASO1019 (0.5 -1)	QASO1020 (0.5 -1)	QASO1021 (0.5 -1)	QASO1022 (0.5 -1)	QASO1023 (0.5 -1)	QASO1023 (5.0 - 5.5)	QASO1023FD (5.0 - 5.5)	QASO1024 (0.5 -1)	QASO1025 (0.5 -1)	QASO1026 (0.5 -1)	QASO1027 (0.5 -1)		Site
Date Sampled	(µg/kg)	(µg/kg)	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/08/1988	CS-17 11/08/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	CS-17 11/04/1988	Date Sampled
Pesticide/PCBs															
a-BHC	1.7	203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/08/1988
b-BHC	1.7	76.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/08/1988
d-BHC	1.7	(none)	ND	ND	ND	1.2 J	ND	ND	ND	ND	ND	12 J	ND	ND	CS-17 11/04/1988
γ-BHC (lindane)	1.7	224	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Heptachlor	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aldrin	1.7	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Heptachlor epoxide	1.7	235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Endosulfan I	1.7	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Dieldrin	3.3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
4,4'-DDE	3.3	227	ND	ND	2.4 J	5.5 J	3.4 J	ND	ND	ND	3.7 J	380	ND	ND	CS-17 11/04/1988
Endrin	3.3	15.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Endosulfan II	3.3	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
4,4'-DDD	3.3	2410	ND	ND	ND	2.7 J	ND	ND	ND	ND	ND	910	ND	ND	CS-17 11/04/1988
Endosulfan sulfate	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
4,4'-DDT	3.3	250	ND	ND	2.2 J	7.7 J	4.5 J	ND	ND	ND	21 J	620 J	ND	ND	CS-17 11/04/1988
Methoxychlor	17	12500	ND	ND	3.9 J	ND	ND	ND	ND	ND	9.2 J	ND	2.4 J	ND	CS-17 11/04/1988
Endrin ketone	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Endrin aldehyde	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
α-Chlordane	1.7	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	14 J	ND	ND	CS-17 11/04/1988
γ-Chlordane	1.7	87.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Toxaphene	170	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1016	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1221	67	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1232	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1242	33	156	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1246	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	CS-17 11/04/1988
Aroclor 1254	33	158	ND	ND	16 J	22 J	8.9 J	ND	ND	ND	ND	270 J	ND	ND	CS-17 11/04/1988
Aroclor 1260	33	156	ND	ND	20 J	36 J	15 J	ND	ND	ND	ND	280 J	ND	ND	CS-17 11/04/1988
TAL Metals	(mg/kg)	(mg/kg)													
Arsenic	2.0	3.6	0.74 J	1.0 J	1.4 J	2.1 J	2.5	1.5 J	1.2 J	3.6	2.5	3.3	0.97 J	1.2 J	
Cadmium	1.0	1.5	ND	ND	ND	0.7 J	0.15 J	ND	ND	ND	ND	0.59 J	ND	ND	
Chromium	2.0	6.6	ND	2.5	6.4	13.3	5.6	4.7	4.7	11.6	5.4	33	2.6	2.7	
Copper	5.0	19.3	2.1 J	2.0 J	12.5	37	10.4	16 J	1.9 J	1.9 J	2.1 J	125	1.4 J	2.6 J	
Lead	0.8	15.6	4.4	5.7	39.8	121	13.6	3.0	2.9	6.3	8.2	272	2.6	1.9	
Mercury	0.1	1.5	0.16	0.21	2.5	5.5	0.64	ND	0.25	ND	ND	26.5	ND	ND	
Zinc	4.1	16.0	6.5	10.6	16.3	61.8	18.6	17.1	16.9	14.2	9.3	69.8	6.4	6.5	
VOCs	(µg/kg)	(µg/kg)													
Acetone	20	6260	—	—	—	—	—	16 J	16 J	—	—	—	—	27 J	
Chloroform	5	100	—	—	—	—	—	ND	ND	—	—	—	—	ND	
Methylene Chloride	5	10	—	—	—	—	—	ND	ND	—	—	—	—	ND	

J = Estimated value
 ND = Analyte sampled for but not detected
BOLD = Concentrations exceeding STCLs for clean fill
 '...' = Sample not collected at this location

ATTACHMENT B

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

Site	Reporting Limit	Soil Target Cleanup Levels (STCL)	CS-17 11/04/1998	CS-17 11/04/1998	CS-17 11/04/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998	CS-16 10/27/1998
Pesticide/PCBs	(µg/kg)	(µg/kg)													
a-BHC	1.7	203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
b-BHC	1.7	78.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
d-BHC	1.7	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-BHC (lindane)	1.7	224	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	1.7	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1.7	235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	1.7	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	3.3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	3.3	227	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	3.3	15.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	3.3	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	3.3	2410	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	3.3	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	17	12500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-Chlordane	1.7	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-Chlordane	1.7	87.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	170	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	67	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TAL Metals	(mg/kg)	(mg/kg)													
Arsenic	2.0	3.6	4.0	1.8 J	2.8	1.2 J	0.61 J	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	1.0	1.5	0.1 J	ND	ND	0.11 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	2.0	6.8	8.2	4.1	7.1	4.3	2.7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Copper	5.0	19.3	2.1 J	1.4 J	1.4 J	15	7	13.3	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Lead	0.6	15.8	10.9	5.8	6.3	7.9	1.2	7.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
Mercury	0.1	1.5	ND	ND	ND	0.3	ND	0.36	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Zinc	4.1	16.0	11.2	7.5	11.1	17.4	7.2	8.9	8.7	8.7	8.7	8.7	8.7	8.7	8.7
VOCs	(µg/kg)	(µg/kg)													
Acetone	20	6250	---	---	---	---	ND	---	---	---	---	---	---	---	---
Chloroform	5	100	---	---	---	---	ND	---	---	---	---	---	---	---	---
Methylene Chloride	5	10	---	---	---	---	ND	---	---	---	---	---	---	---	---

J = Estimated value
 ND = Analyte sampled but not detected
 --- = Concentrations exceeding STCL's for clean fill
 --- = Sample not collected at this location

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

J = Estimated value
ND = Analyte sampled for but not detected
BOLD = Concentrations exceeding STCLs for clean fill
'...' = Sample not collected at this location

ATTACHMENT B

Table 3
Analytical Results of Surface and Subsurface Soil Sampling at CS-16/CS-17

Site	Reporting Limit	Soil Target Cleanup Levels (STCL)	CS-16 11/02/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 10/28/1998	CS-16 11/02/1998	CS-16 11/02/1998	CS-16 11/02/1998
Date Sampled													
Pesticide/PCBs	(µg/kg)	(µg/kg)											
a-BHC	1.7	203	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
b-BHC	1.7	78.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
d-BHC	1.7	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-BHC (lindane)	1.7	224	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	1.7	34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	1.7	235	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	1.7	219	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	3.3	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	3.3	227	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	3.3	15.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	3.3	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	3.3	2410	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	3.3	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	17	12500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	3.3	(none)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
α-Chlordane	1.7	1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
γ-Chlordane	1.7	87.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	170	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	67	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	33	158	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TAL Metals	(mg/kg)	(mg/kg)											
Arsenic	2.0	3.6	0.65 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.62 J
Cadmium	1.0	1.5	ND	0.11 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	2.0	6.8	1.9 J	1.8 J	1.4 J	ND	ND	ND	ND	ND	ND	ND	1.2 J
Copper	5.0	18.3	3.7 J	5.8	6.3	5.3	3.5 J	15.1	3.1 J	1.6 J	ND	ND	ND
Lead	0.6	15.8	1.7	1.6	2.6	2.2	1.4	8.4	1.7	2.2 J	ND	ND	ND
Mercury	0.1	1.5	ND	ND	0.07 J	ND	ND	0.28	0.05 J	ND	ND	ND	ND
Zinc	4.1	16.0	ND	16.2	5.5	9.9	ND	9.8	5.6	5.1	ND	ND	ND
VOCs	(µg/kg)	(µg/kg)											
Acetone	20	6250	ND	---	---	ND	ND	---	---	---	ND	ND	ND
Chloroform	5	100	ND	---	---	ND	ND	---	---	---	ND	ND	ND
Methylene Chloride	5	10	ND	---	---	ND	ND	---	---	---	ND	ND	ND

J = Estimated value
 ND = Analyte sampled for but not detected
BOLD = Concentrations exceeding STCLs for clean fill
 '-' = Sample not collected at this location

ATTACHMENT C

DATA SUMMARY REPORT

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ACRONYMS AND ABBREVIATIONS

AFCEE	U.S. Air Force Center for Environmental Excellence
CLP	Contract Laboratory Program
DQO	data quality objective
DSR	data summary report
EB	equipment blank
EPA	U.S. Environmental Protection Agency
FD	field duplicate
IDL	instrument detection limit
IS	internal standard
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOC ID	location identification
MMR	Massachusetts Military Reservation
MS	matrix spike
MSD	matrix spike duplicate
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCB	polychlorinated biphenyls
QC	quality control
QPP	<i>Quality Program Plan</i>
RL	reporting limit
RPD	relative percent difference
TB	trip blank
VOC	volatile organic compound
%D	percent difference
%RSD	percent relative standard deviation
µg/L	micrograms per liter

(intentionally blank)

1.0 SAMPLE COLLECTION

Jacobs Engineering Group Inc. collected shallow surface soil samples from 50 locations and subsurface soil samples from 14 locations at the CS-16 and CS-17 source areas. The analytical results were evaluated to obtain sufficient data to meet the data quality objectives of the investigation. The samples included in this Data Summary Report (DSR) were collected between October 27 and November 6, 1998; they include seven field duplicate (FD) samples, five equipment blank (EB) samples, four trip blank (TB) samples and two matrix spike/matrix spike duplicate (MS/MSD) sample pairs. The samples were analyzed in accordance with the U.S. Environmental Protection Agency (EPA) methods specified in Appendix 3-A of the Massachusetts Military Reservation (MMR) *Quality Program Plan* (QPP) (Air Force Center for Environmental Excellence, 1998).

Actual sampling locations and analyses, which are included in this DSR, are summarized in Section 2.0. All data were reviewed in accordance with MMR project-specific data review guidelines, which are defined in the MMR technical procedure Analytical Chemistry Data Review (MMR TECH-055 in the QPP).

2.0 SAMPLE IDENTIFICATION

Table 2-1 lists the samples that were collected and analyzed as part of this sampling event. Each unique Jacobs' chain-of-custody control number is cross-referenced with its location identification (LOC ID), sample number, date sampled, sample depths, subcontracted analytical laboratory and the analyses performed on each sample. Data completeness (LOC IDs and requested analyses) was verified against the chains-of-custody during the data review process. The MMR data management group maintains all chain-of-custody forms in project files.

TABLE 2-1
Sample Identification Cross-Reference and Analyses

Control Number	Location ID	Sample Number	Date Sampled	Analytical Method	Sample Type	Sample Depth	Lab
MM-J000101	34SO1031	34SO1031-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000201	34SO1031	34SO1031-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000102	34SO1032	34SO1032-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000203	34SO1032	34SO1032-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000103	34SO1033	34SO1033-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000205	34SO1033	34SO1033-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000401	34SO1034	34SO1034-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000501	34SO1034	34SO1034-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000403	34SO1035	34SO1035-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000502	34SO1035	34SO1035-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000405	34SO1036	34SO1036-01	10/27/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000503	34SO1036	34SO1036-01	10/27/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000601	34SO1037	34SO1037-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000701	34SO1037	34SO1037-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000603	34SO1038	34SO1038-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000702	34SO1038	34SO1038-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000605	34SO1039	34SO1039-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000703	34SO1039	34SO1039-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J000901	34SO1040	34SO1040-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001001	34SO1040	34SO1040-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000902	34SO1041	34SO1041-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001003	34SO1041	34SO1041-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J000903	34SO1042	34SO1042-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001005	34SO1042	34SO1042-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001101	34SO1043	34SO1043-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001201	34SO1043	34SO1043-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001102	34SO1044	34SO1044-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001203	34SO1044	34SO1044-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001204	34SO1044	34SO1044-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001103	34SO1045	34SO1045-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001205	34SO1045	34SO1045-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001301	34SO1046	34SO1046-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001401	34SO1046	34SO1046-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001302	34SO1047	34SO1047-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001403	34SO1047	34SO1047-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001303	34SO1048	34SO1048-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001405	34SO1048	34SO1048-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001501	34SO1049	34SO1049-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001601	34SO1049	34SO1049-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001502	34SO1050	34SO1050-01	10/28/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J001603	34SO1050	34SO1050-01	10/28/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J001802	34SO1031	34SO1031-02	10/29/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J001803	34SO1031	34SO1031-02	10/29/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J001901	34SO1031	34SO1031-02	10/29/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J001804	34SO1033	34SO1033-02	10/29/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J001805	34SO1033	34SO1033-02	10/29/98	SW8260/5035 (VOC)	N1	5 '	QESK

TABLE 2-1
Sample Identification Cross-Reference and Analyses

Control Number	Location ID	Sample Number	Date Sampled	Analytical Method	Sample Type	Sample Depth	Lab
MM-J001902	34SO1033	34SO1033-02	10/29/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J001806	34SO1037	34SO1037-02	10/29/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J001807	34SO1037	34SO1037-02	10/29/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J001903	34SO1037	34SO1037-02	10/29/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J003001	34SO1037	34SO1037-02FD	10/29/98	OLM 03.1(Pest/PCB)	FD1	5'	SVTM
MM-J003101	34SO1037	34SO1037-02FD	10/29/98	ILM 04.0 (METAL)	FD1	5'	QESK
MM-J003102	34SO1037	34SO1037-02FD	10/29/98	SW8260/5035 (VOC)	FD1	5'	QESK
MM-J001808	34SO1039	34SO1039-02	10/29/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J001809	34SO1039	34SO1039-02	10/29/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J001904	34SO1039	34SO1039-02	10/29/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J002401	FIELDQC	102998-EB2-501	10/29/98	ILM 04.0 (METAL)	EB2		QESK
MM-J002402	FIELDQC	102998-EB2-501	10/29/98	SW8260/5035 (VOC)	EB2		QESK
MM-J002501	FIELDQC	102998-EB2-501	10/29/98	OLM 03.1(Pest/PCB)	EB2		SVTM
MM-J001801	FIELDQC	102998-TB2-501	10/29/98	SW8260/5035 (VOC)	TB2		QESK
MM-J002001	34SO1041	34SO1041-02	11/02/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J002002	34SO1041	34SO1041-02	11/02/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J002101	34SO1041	34SO1041-02	11/02/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J002003	34SO1044	34SO1044-02	11/02/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J002004	34SO1044	34SO1044-02	11/02/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J002102	34SO1044	34SO1044-02	11/02/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J003201	34SO1044	34SO1044-02FD	11/02/98	OLM 03.1(Pest/PCB)	FD1	5'	SVTM
MM-J003301	34SO1044	34SO1044-02FD	11/02/98	ILM 04.0 (METAL)	FD1	5'	QESK
MM-J003302	34SO1044	34SO1044-02FD	11/02/98	SW8260/5035 (VOC)	FD1	5'	QESK
MM-J002005	34SO1047	34SO1047-02	11/02/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J002006	34SO1047	34SO1047-02	11/02/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J002103	34SO1047	34SO1047-02	11/02/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J003401	34SO1047	34SO1047-02FD	11/02/98	OLM 03.1(Pest/PCB)	FD1	5'	SVTM
MM-J003501	34SO1047	34SO1047-02FD	11/02/98	ILM 04.0 (METAL)	FD1	5'	QESK
MM-J003502	34SO1047	34SO1047-02FD	11/02/98	SW8260/5035 (VOC)	FD1	0.5'	QESK
MM-J002007	34SO1050	34SO1050-02	11/02/98	ILM 04.0 (METAL)	N1	5'	QESK
MM-J002008	34SO1050	34SO1050-02	11/02/98	SW8260/5035 (VOC)	N1	5'	QESK
MM-J002104	34SO1050	34SO1050-02	11/02/98	OLM 03.1(Pest/PCB)	N1	5'	SVTM
MM-J002201	34SO1050	34SO1050-02FD	11/02/98	ILM 04.0 (METAL)	FD1	5'	QESK
MM-J002202	34SO1050	34SO1050-02FD	11/02/98	SW8260/5035 (VOC)	FD1	5'	QESK
MM-J002301	34SO1050	34SO1050-02FD	11/02/98	OLM 03.1(Pest/PCB)	FD1	5'	SVTM
MM-J002601	FIELDQC	102998-EB3-501	11/02/98	OLM 03.1(Pest/PCB)	EB3		SVTM
MM-J002701	FIELDQC	102998-EB3-501	11/02/98	ILM 04.0 (METAL)	EB3		QESK
MM-J002702	FIELDQC	102998-EB3-501	11/02/98	SW8260/5035 (VOC)	EB3		QESK
MM-J005101	FIELDQC	110298-TB7-501	11/02/98	SW8260/5035 (VOC)	TB7		QESK
MM-J004701	34SO1001	34SO1001-01	11/03/98	ILM 04.0 (METAL)	N1	0.5'	QESK
MM-J004801	34SO1001	34SO1001-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5'	SVTM
MM-J004702	34SO1002	34SO1002-01	11/03/98	ILM 04.0 (METAL)	N1	0.5'	QESK
MM-J004802	34SO1002	34SO1002-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5'	SVTM
MM-J004703	34SO1003	34SO1003-01	11/03/98	ILM 04.0 (METAL)	N1	0.5'	QESK
MM-J004803	34SO1003	34SO1003-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5'	SVTM
MM-J004901	34SO1004	34SO1004-01	11/03/98	ILM 04.0 (METAL)	N1	0.5'	QESK
MM-J005001	34SO1004	34SO1004-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5'	SVTM

TABLE 2-1
Sample Identification Cross-Reference and Analyses

Control Number	Location ID	Sample Number	Date Sampled	Analytical Method	Sample Type	Sample Depth	Lab
MM-J004902	34SO1005	34SO1005-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005002	34SO1005	34SO1005-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J004903	34SO1006	34SO1006-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005003	34SO1006	34SO1006-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005201	34SO1007	34SO1007-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005301	34SO1007	34SO1007-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005202	34SO1008	34SO1008-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005302	34SO1008	34SO1008-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005203	34SO1008	34SO1008-01FD	11/03/98	OLM 03.1(Pest/PCB)	FD1	0.5 '	SVTM
MM-J005303	34SO1008	34SO1008-01FD	11/03/98	ILM 04.0 (METAL)	FD1	0.5 '	QESK
MM-J005204	34SO1009	34SO1009-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005304	34SO1009	34SO1009-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005401	34SO1010	34SO1010-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005701	34SO1010	34SO1010-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005402	34SO1011	34SO1011-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005702	34SO1011	34SO1011-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005403	34SO1012	34SO1012-01	11/03/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005703	34SO1012	34SO1012-01	11/03/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005501	FIELDQC	110398-EB2-501	11/03/98	OLM 03.1(Pest/PCB)	EB2		SVTM
MM-J005601	FIELDQC	110398-EB2-501	11/03/98	ILM 04.0 (METAL)	EB2		QESK
MM-J005801	34SO1013	34SO1013-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005901	34SO1013	34SO1013-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005802	34SO1014	34SO1014-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005902	34SO1014	34SO1014-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J005803	34SO1015	34SO1015-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J005903	34SO1015	34SO1015-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006201	34SO1019	34SO1019-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006301	34SO1019	34SO1019-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006202	34SO1020	34SO1020-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006302	34SO1020	34SO1020-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006203	34SO1021	34SO1021-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006303	34SO1021	34SO1021-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006401	34SO1022	34SO1022-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006501	34SO1022	34SO1022-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006402	34SO1023	34SO1023-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006502	34SO1023	34SO1023-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006403	34SO1024	34SO1024-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006503	34SO1024	34SO1024-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006601	34SO1025	34SO1025-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006701	34SO1025	34SO1025-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006602	34SO1026	34SO1026-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006702	34SO1026	34SO1026-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006603	34SO1027	34SO1027-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006703	34SO1027	34SO1027-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006801	34SO1028	34SO1028-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006901	34SO1028	34SO1028-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006802	34SO1029	34SO1029-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM

TABLE 2-1
Sample Identification Cross-Reference and Analyses

Control Number	Location ID	Sample Number	Date Sampled	Analytical Method	Sample Type	Sample Depth	Lab
MM-J006902	34SO1029	34SO1029-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006803	34SO1030	34SO1030-01	11/04/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006903	34SO1030	34SO1030-01	11/04/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J007001	FIELDQC	110498-EB2-501	11/04/98	OLM 03.1(Pest/PCB)	EB2		SVTM
MM-J007101	FIELDQC	110498-EB2-501	11/04/98	ILM 04.0 (METAL)	EB2		QESK
MM-J007201	34SO1005	34SO1005-02	11/05/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007301	34SO1005	34SO1005-02	11/05/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007302	34SO1005	34SO1005-02	11/05/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007202	34SO1009	34SO1009-02	11/05/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007303	34SO1009	34SO1009-02	11/05/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007304	34SO1009	34SO1009-02	11/05/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007203	34SO1014	34SO1014-02	11/05/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007305	34SO1014	34SO1014-02	11/05/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007306	34SO1014	34SO1014-02	11/05/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007204	34SO1014	34SO1014-02FD	11/05/98	OLM 03.1(Pest/PCB)	FD1	5 '	SVTM
MM-J007307	34SO1014	34SO1014-02FD	11/05/98	ILM 04.0 (METAL)	FD1	5 '	QESK
MM-J007308	34SO1014	34SO1014-02FD	11/05/98	SW8260/5035 (VOC)	FD1	5 '	QESK
MM-J006001	34SO1016	34SO1016-01	11/05/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006101	34SO1016	34SO1016-01	11/05/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006002	34SO1017	34SO1017-01	11/05/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006102	34SO1017	34SO1017-01	11/05/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J006003	34SO1018	34SO1018-01	11/05/98	OLM 03.1(Pest/PCB)	N1	0.5 '	SVTM
MM-J006103	34SO1018	34SO1018-01	11/05/98	ILM 04.0 (METAL)	N1	0.5 '	QESK
MM-J007601	FIELDQC	110598-TB2-501	11/05/98	SW8260/5035 (VOC)	TB3		QESK
MM-J007801	FIELDQC	110598-EB2-501	11/05/98	ILM 04.0 (METAL)	EB2		QESK
MM-J007802	FIELDQC	110598-EB2-501	11/05/98	SW8260/5035 (VOC)	EB2		QESK
MM-J007701	FIELDQC	110598-EB2-501	11/05/98	OLM 03.1(Pest/PCB)	EB2		SVTM
MM-J007401	34SO1016	34SO1016-02	11/06/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007501	34SO1016	34SO1016-02	11/06/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007502	34SO1016	34SO1016-02	11/06/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007402	34SO1023	34SO1023-02	11/06/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007503	34SO1023	34SO1023-02	11/06/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007504	34SO1023	34SO1023-02	11/06/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007403	34SO1023	34SO1023-02FD	11/06/98	OLM 03.1(Pest/PCB)	FD1	5 '	SVTM
MM-J007505	34SO1023	34SO1023-02FD	11/06/98	ILM 04.0 (METAL)	FD1	5 '	QESK
MM-J007506	34SO1023	34SO1023-02FD	11/06/98	SW8260/5035 (VOC)	FD1	5 '	QESK
MM-J007404	34SO1027	34SO1027-02	11/06/98	OLM 03.1(Pest/PCB)	N1	5 '	SVTM
MM-J007507	34SO1027	34SO1027-02	11/06/98	ILM 04.0 (METAL)	N1	5 '	QESK
MM-J007508	34SO1027	34SO1027-02	11/06/98	SW8260/5035 (VOC)	N1	5 '	QESK
MM-J007901	FIELDQC	110698-TB3-501	11/06/98	SW8260/5035 (VOC)	TB3		QESK

SW8260/5035 (VOC) = Volatile organic compounds

OLM03.1 (Pest/PCB) = Pesticides and polychlorinated biphenyls

ILM04.0 (Metals) = Select metals (As, Cd, Cr, Cu, Pb, Hg, Zn)

EB = equipment blank

FD = field duplicate

N1 = native sample

TB = trip blank

SVTM = Severn Trent Laboratories; Monroe, CT

QESK = Quanterra Environmental Services; Knoxville, TN

3.0 ANALYTICAL PARAMETERS

All samples were analyzed according to established EPA methods specified in the MMR *Quality Program Plan* and the Streamlined Sampling and Analysis Plan by analytical laboratories under subcontract to perform work for the plume response program at MMR.

Data quality is measured by five parameters: precision, accuracy, representativeness, completeness, and comparability (PARCC). The goals set for each of these parameters are referred to as the data quality objectives (DQOs). Actual sample and quality control results are compared to the project DQOs to determine whether quality objectives were met for the sampling event.

Precision is defined as the degree of agreement between measurements. Sampling precision is evaluated by comparing the results of field duplicate pairs. Analytical precision is evaluated by comparing results between laboratory duplicate analyses, such as laboratory control sample (LCS) and laboratory control sample duplicate (LCSD), and MS/MSD samples.

Accuracy is defined as the degree to which the detected value represents the true value. Analytical accuracy is evaluated using surrogate spike recoveries, MS/MSD results and LCS/LCSD recoveries.

Representativeness reflects the ability to collect a sample that, when analyzed or measured, reflects the in situ conditions of the sample. Representativeness is measured by how well the sample collection event followed the proposed investigation so as to provide results that accurately depict the media and environmental conditions being evaluated. Documentation of field events confirms that proper protocols were followed and analytical data are representative of the contaminant levels at that site.

Completeness is a measure of the amount of valid, usable data obtained from the sampling event compared to the amount of data that was expected under normal conditions. Results that are rejected (coded R) by the data review process may be disqualified from application to the intended use of the data.

Comparability is a measure of how well the data set parallels related data sets. Comparability was achieved by using established EPA methods for field sampling and standard analytical procedures.

4.0 DISCUSSION OF NONCOMPLIANT DATA

This section discusses data that were found to be noncompliant with established quality control (QC) requirements. Qualification of results was based on laboratory and field QC data. Laboratory QC data includes holding time compliance, sample preservation, instrument calibration criteria, surrogate recovery results, internal standard area counts, laboratory blank contamination, laboratory replicate results, MS/MSD analyses and LCS/LCSD recoveries. Field QC data include EBs, TBs, and FD samples.

The following qualifiers were applied to the data during the review process:

- U - The analyte was analyzed for but was not detected.
- J - The analyte was detected, and the reported concentration is an estimated value.
- UJ - The analyte was not detected but the reporting limit is an estimated value due to QC noncompliance.
- R - The analyte value is rejected; result is unusable due to QC noncompliance.

Contract laboratory program (CLP) method-specific qualifiers used by the laboratory to designate noncompliant values have been either accepted or replaced with one of

the above qualifiers. Data review qualifiers were entered into the database from which results for this sampling event were reported.

4.1 LABORATORY QUALITY CONTROL

Laboratory QC is achieved by using established EPA analytical methods for analyzing field samples. Laboratory QC samples consist of: laboratory blanks, laboratory replicate samples, MS/MSD samples, LCS/LCSDs, and QC check samples, as indicated by the methods. A review of the results of method-specific laboratory QC establishes the quality of the data. This section contains an assessment of the laboratory QC procedures, samples and protocol.

4.1.1 Holding Times

When samples are analyzed beyond their respective holding times or if the laboratory receives a cooler in which the temperature exceeds six degrees Celsius, positive results are suspected to be biased low and nondetected results are suspected to be false negatives.

All samples in this data set were properly preserved upon receipt at the laboratory and were analyzed within method-specific holding times.

4.1.2 Instrument Calibration

Several samples were analyzed in analytical batches that did not meet either initial or continuing calibration criteria for some volatile organic compounds (VOCs). Sample analyses with associated noncompliant instrument calibrations are summarized in Table 4-1.

TABLE 4-1
CALIBRATION NONCOMPLIANCE SUMMARY

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1005	34SO1005-02	11/05/98	ACETONE	J
34SO1005	34SO1005-02	11/05/98	BROMOMETHANE	UJ

**TABLE 4-1
CALIBRATION NONCOMPLIANCE SUMMARY**

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1005	34SO1005-02	11/05/98	METHYLENE CHLORIDE	J
34SO1005	34SO1009-02	11/05/98	ACETONE	J
34SO1005	34SO1009-02	11/05/98	BROMODICHLOROMETHANE	UJ
34SO1005	34SO1023-02	11/05/98	METHYLENE CHLORIDE	J
34SO1014	34SO1014-02	11/05/98	ACETONE	J
34SO1014	34SO1014-02FD	11/05/98	ACETONE	J
34SO1014	34SO1014-02	11/05/98	BROMOMETHANE	UJ
34SO1014	34SO1014-02FD	11/05/98	BROMOMETHANE	UJ
34SO1014	34SO1014-02	11/05/98	METHYLENE CHLORIDE	J
34SO1014	34SO1014-02FD	11/05/98	METHYLENE CHLORIDE	J
34SO1016	34SO1016-02	11/06/98	ACETONE	J
34SO1023	34SO1023-02	11/06/98	ACETONE	J
34SO1023	34SO1023-02FD	11/06/98	ACETONE	J
34SO1023	34SO1023-02	11/06/98	BROMOMETHANE	UJ
34SO1023	34SO1023-02FD	11/06/98	BROMOMETHANE	UJ
34SO1027	34SO1027-02	11/06/98	ACETONE	J
34SO1027	34SO1027-02	11/06/98	BROMOMETHANE	UJ
34SO1039	34SO1039-02	10/29/98	BROMOMETHANE	J

J = estimated result

UJ = estimated nondetect

The positive and nondetected analytical results for the VOCs acetone, bromomethane, methylene chloride and bromodichloromethane in eight soil samples were qualified as estimated (J or UJ) as a result of noncompliant calibration percent relative standard deviation (%RSD) and percent difference (%D). Calibration criteria were acceptable for all other analyses.

4.1.3 Laboratory Blanks

Laboratory method blanks were prepared and analyzed along with each batch of environmental samples. Laboratory method blanks were evaluated against their associated (same analytical batch) field samples to determine if a laboratory condition contributed to positive detects in the field samples.

Sample data were qualified based on laboratory blank results when the results for associated compounds or analytes were less than established action levels. Action levels were established at five times the maximum concentration (10 times for common organic laboratory contaminants) in applicable laboratory blanks. The

qualified results should be considered false positives and were qualified as undetected (coded U) in respective samples. Analytical results which were qualified due to laboratory blank contamination are summarized in Table 4-2.

TABLE 4-2
LABORATORY BLANK QUALIFICATION SUMMARY

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1001	34SO1001-01	11/03/98	MERCURY (TOTAL)	U
34SO1002	34SO1002-01	11/03/98	MERCURY (TOTAL)	U
34SO1003	34SO1003-01	11/03/98	MERCURY (TOTAL)	U
34SO1004	34SO1004-01	11/03/98	MERCURY (TOTAL)	U
34SO1005	34SO1005-01	11/03/98	MERCURY (TOTAL)	U
34SO1006	34SO1006-01	11/03/98	MERCURY (TOTAL)	U
34SO1007	34SO1007-01	11/03/98	MERCURY (TOTAL)	U
34SO1008	34SO1008-01	11/03/98	MERCURY (TOTAL)	U
34SO1009	34SO1009-01	11/03/98	MERCURY (TOTAL)	U
34SO1010	34SO1010-01	11/03/98	MERCURY (TOTAL)	U
34SO1028	34SO1023-02	11/06/98	MERCURY (TOTAL)	U
34SO1024	34SO1027-01	11/04/98	MERCURY (TOTAL)	U
34SO1025	34SO1025-01	11/04/98	MERCURY (TOTAL)	U
34SO1027	34SO1027-01	11/04/98	MERCURY (TOTAL)	U
34SO1028	34SO1027-02	11/06/98	MERCURY (TOTAL)	U
34SO1028	34SO1028-01	11/04/98	MERCURY (TOTAL)	U
34SO1029	34SO1009-01	11/02/98	MERCURY (TOTAL)	U
34SO1030	34SO1041-02	11/02/98	MERCURY (TOTAL)	U
34SO1041	34SO1041-02	11/02/98	MERCURY (TOTAL)	U
34SO1030	34SO1030-01	11/04/98	MERCURY (TOTAL)	U
34SO1030	34SO1044-02	11/02/98	MERCURY (TOTAL)	U
34SO1044	34SO1044-02FD	11/02/98	MERCURY (TOTAL)	U
34SO1044	34SO1044-02	11/02/98	MERCURY (TOTAL)	U
34SO1044	34SO1044-02FD	11/02/98	MERCURY (TOTAL)	U
34SO1047	34SO1044-02	11/02/98	MERCURY (TOTAL)	U
34SO1030	34SO1047-02FD	11/02/98	MERCURY (TOTAL)	U
34SO1006	34SO1050-02	11/02/98	MERCURY (TOTAL)	U
34SO1050	34SO1050-02FD	11/02/98	MERCURY (TOTAL)	U
34SO1033	34SO1044-02	10/29/98	ZINC (TOTAL)	U
34SO1047	34SO1039-02	10/29/98	ZINC (TOTAL)	U
34SO1016	34SO1016-02	11/02/98	ZINC (TOTAL)	U
34SO1030	34SO1044-01	10/29/98	ZINC (TOTAL)	U
34SO1030	34SO1044-02FD	11/02/98	ZINC (TOTAL)	U
34SO1047	34SO1047-01	10/28/98	ZINC (TOTAL)	U
34SO1047	34SO1047-02FD	11/02/98	ZINC (TOTAL)	U
34SO1016	34SO1016-02	11/06/98	METHYLENE CHLORIDE	U
34SO1023	34SO1023-02	11/06/98	METHYLENE CHLORIDE	U
34SO1023	34SO1023-02FD	11/06/98	METHYLENE CHLORIDE	U
34SO1027	34SO1027-02	11/06/98	METHYLENE CHLORIDE	U
34SO1039	34SO1031-02	10/28/98	METHYLENE CHLORIDE	U
34SO1039	34SO1033-02	10/28/98	METHYLENE CHLORIDE	U
34SO1030	34SO1039-02	10/29/98	METHYLENE CHLORIDE	U
34SO1030	34SO1037-02FD	10/29/98	METHYLENE CHLORIDE	U
34SO1039	34SO1039-02	10/28/98	METHYLENE CHLORIDE	U
34SO1041	34SO1041-02	11/02/98	METHYLENE CHLORIDE	U
34SO1044	34SO1044-02	11/02/98	METHYLENE CHLORIDE	U
34SO1044	34SO1044-02FD	11/02/98	METHYLENE CHLORIDE	U

**TABLE 4-2
LABORATORY BLANK QUALIFICATION SUMMARY**

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1047	34SO1047-02	11/02/98	METHYLENE CHLORIDE	U
34SO1047	34SO1047-02FD	11/02/98	METHYLENE CHLORIDE	U
34SO1050	34SO1050-02	11/02/98	METHYLENE CHLORIDE	U
34SO1050	34SO1050-02FD	11/02/98	METHYLENE CHLORIDE	U
34SO1031	34SO1031-02	10/29/98	ACETONE	U
34SO1033	34SO1033-02	10/29/98	ACETONE	U
34SO1037	34SO1037-02	10/29/98	ACETONE	U
34SO1037	34SO1047-02FD	10/29/98	ACETONE	U
34SO1037	34SO1039-02	10/29/98	ACETONE	U
34SO1031	34SO1041-02	11/02/98	ACETONE	U
34SO1044	34SO1044-02	11/02/98	ACETONE	U
34SO1044	34SO1044-02FD	11/02/98	ACETONE	U
34SO1047	34SO1047-02	11/02/98	ACETONE	U
34SO1047	34SO1047-02FD	11/02/98	ACETONE	U
34SO1050	34SO1050-02	11/02/98	ACETONE	U
34SO1050	34SO1050-02FD	11/02/98	ACETONE	U

U = Not detected

Laboratory blanks associated with the pesticide and PCB analyses were free from contamination. The common VOC laboratory contaminants acetone and methylene chloride were detected in associated laboratory blanks. The analytes mercury and zinc were detected in associated metals laboratory blanks. The results for acetone in 12 soil samples and methylene chloride in 16 soil samples were qualified as nondetect (U). The results for mercury in 22 soil samples and zinc in seven soil samples were also qualified as nondetect (U). The project-required reporting limits (RLs) for metals listed in the methods are often much greater than the laboratory's instrument detection limit (IDL) for an analyte. The laboratory is required to report all results detected above the IDL. Thus, laboratory blanks frequently contain trace levels of analytes that fall between the IDL and the RL which subsequently lead to qualification of associated low-level analytical results.

Positive and nondetected results for copper and arsenic were qualified as estimated (coded J or UJ) due to negative laboratory blank values. The qualified samples and affected metals results are summarized in Table 4-3; these nondetected results are potentially biased low.

**TABLE 4-3
NEGATIVE BLANK SUMMARY**

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1001	34SO1001-01	11/04/98	COPPER (TOTAL)	J
34SO1002	34SO1002-01	11/04/98	COPPER (TOTAL)	J
34SO1003	34SO1003-01	11/04/98	COPPER (TOTAL)	J
34SO1004	34SO1004-01	11/04/98	COPPER (TOTAL)	J
34SO1005	34SO1005-01	11/04/98	COPPER (TOTAL)	J
34SO1006	34SO1006-01	11/04/98	COPPER (TOTAL)	J
34SO1009	34SO1009-01	11/04/98	COPPER (TOTAL)	J
34SO1010	34SO1010-01	11/04/98	COPPER (TOTAL)	J
34SO1024	34SO1024-01	11/04/98	COPPER (TOTAL)	J
34SO1025	34SO1025-01	11/04/98	COPPER (TOTAL)	J
34SO1027	34SO1027-01	11/04/98	COPPER (TOTAL)	J
34SO1029	34SO1029-01	11/04/98	COPPER (TOTAL)	J
34SO1030	34SO1030-01	11/04/98	COPPER (TOTAL)	J
34SO1031	34SO1031-01	10/27/98	ARSENIC (TOTAL)	J
34SO1031	34SO1031-02	10/27/98	ARSENIC (TOTAL)	J
34SO1032	34SO1032-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1033	34SO1033-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1033	34SO1033-02	10/28/98	ARSENIC (TOTAL)	UJ
34SO1034	34SO1034-01	10/27/98	ARSENIC (TOTAL)	J
34SO1035	34SO1035-01	10/27/98	ARSENIC (TOTAL)	J
34SO1036	34SO1036-01	10/27/98	ARSENIC (TOTAL)	J
34SO1037	34SO1037-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1034	34SO1037-02FD	10/29/98	ARSENIC (TOTAL)	J
34SO1038	34SO1038-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1039	34SO1039-01	10/28/98	ARSENIC (TOTAL)	J
34SO1039	34SO1039-02	10/29/98	ARSENIC (TOTAL)	UJ
34SO1040	34SO1040-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1041	34SO1041-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1042	34SO1042-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1043	34SO1043-01	10/28/98	ARSENIC (TOTAL)	J
34SO1044	34SO1044-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1045	34SO1045-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1046	34SO1046-01	10/27/98	ARSENIC (TOTAL)	UJ
34SO1047	34SO1047-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1048	34SO1048-01	10/28/98	ARSENIC (TOTAL)	J
34SO1049	34SO1049-01	10/28/98	ARSENIC (TOTAL)	UJ
34SO1050	34SO1050-01	10/28/98	ARSENIC (TOTAL)	UJ

J = estimated results

UJ = estimated nondetect

4.1.4 Laboratory Replicates

Laboratory replicates, which are analyzed with inorganic samples, are used to evaluate analytical precision. Analytical precision is evaluated by comparing the difference between the results when either one of or both the sample and sample replicate results are greater than or equal to five times the RL. When an analyte from

a laboratory replicate did not meet acceptance criteria, the result in the parent sample was qualified as estimated (J) for that analyte. Laboratory replicate analyses were acceptable for all soil samples included in this DSR.

4.1.5 Laboratory Control Samples

LCSs and LCSDs, which were required for all analyses under the Jacobs laboratory subcontract, were submitted without designated MS or MSD samples. The results of the LCS/LCSD analyses provide information on analytical precision and accuracy. LCS/LCSD analyses were acceptable for all data packages submitted with these samples.

4.1.6 Matrix Spike and Matrix Spike Duplicate Samples

Two MS/MSD sample pairs were submitted with these soil samples. MS/MSD recoveries were acceptable for all requested analyses.

4.1.7 Surrogates

Surrogate spike compounds were added to each sample undergoing analysis for VOCs, polychlorinated biphenyls (PCBs), and pesticides to provide information for evaluating accuracy and to assess method performance and extraction efficiency. If surrogate recoveries do not meet preestablished criteria, the analytical results should be considered estimated (J or UJ), indicating probable bias.

Surrogate recoveries were acceptable for all VOC and pesticides/PCB analyses in this sample set.

4.1.8 Internal Standards

Internal standards (IS) are added to samples to be analyzed for VOCs; results that were qualified due to low IS area counts are summarized in Table 4-4.

TABLE 4-4
INTERNAL STANDARD NONCOMPLIANCE SUMMARY

Location	Sample ID	Sampling Date	Analyte	Qualifier
34SO1005	34SO1005-02	11/05/98	1,1,2,2-TETRACHLOROETHANE	R
34SO1005	34SO1005-02	11/05/98	1,1,2-TRICHLOROETHANE	R
34SO1005	34SO1005-02	11/05/98	2-HEXANONE	R
34SO1005	34SO1005-02	11/05/98	BROMOFORM	R
34SO1005	34SO1005-02	11/05/98	CHLOROBENZENE	R
34SO1005	34SO1005-02	11/05/98	DIBROMOCHLOROMETHANE	R
34SO1005	34SO1005-02	11/05/98	ETHYLBENZENE	R
34SO1005	34SO1005-02	11/05/98	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE	R
34SO1005	34SO1005-02	11/05/98	STYRENE	R
34SO1005	34SO1005-02	11/05/98	TETRACHLOROETHYLENE (PCE)	R
34SO1005	34SO1005-02	11/05/98	TOLUENE	R
34SO1005	34SO1005-02	11/05/98	TRANS-1,3-DICHLOROPROPENE	R
34SO1005	34SO1005-02	11/05/98	XYLENES, TOTAL	R
34SO1009	34SO1009-02	11/05/98	1,1,2,2-TETRACHLOROETHANE	R
34SO1014	34SO1014-02	11/05/98	1,1,2,2-TETRACHLOROETHANE	R
34SO1016	34SO1016-02	11/06/98	1,1,2,2-TETRACHLOROETHANE	R
34SO1023	34SO1023-02	11/06/98	1,1,2,2-TETRACHLOROETHANE	R

R = rejected data point

The VOC IS area counts were below acceptance criteria in five soil samples. The nondetected results associated with the low IS area counts were rejected (coded R). The laboratory reanalyzed the samples with similar results, indicating matrix interference. The nondetected results associated with these low IS area counts were rejected (coded R).

4.2 FIELD QUALITY CONTROL

Field QC samples were collected to help assess analytical data quality. Field QC samples consisted of TBs, analyzed for VOCs only, EBs and FD samples.

4.2.1 Equipment Blanks and Trip Blanks

Data may be qualified based on EB and/or TB results when the analyte result in associated samples is less than five times (10 times for common laboratory contaminants) the concentration detected in the EB or TB. Five EB samples and four TB samples were submitted with these samples. Table 4-5 summarizes the samples and associated results which were qualified due to EB contamination.

TABLE 4-5
FIELD BLANK QUALIFICATION SAMPLE SUMMARY

Location	Sample ID	Sample Date	Analyte	Qual
34SO1014	34SO1014-02	11/05/98	COPPER (TOTAL)	U
34SO1014	34SO1014-02FD	11/05/98	COPPER (TOTAL)	U
34SO1014	34SO1014-02	11/05/98	LEAD (TOTAL)	U
34SO1014	34SO1014-02FD	11/05/98	LEAD (TOTAL)	U
34SO1014	34SO1014-02	11/05/98	ZINC (TOTAL)	U
34SO1014	34SO1014-02FD	11/05/98	ZINC (TOTAL)	U
34SO1039	34SO1039-02	10/29/98	COPPER (TOTAL)	U
34SO1039	34SO1039-02	10/29/98	LEAD (TOTAL)	U
34SO1050	34SO1050-02	11/02/98	COPPER (TOTAL)	U
34SO1050	34SO1050-02FD	11/02/98	COPPER (TOTAL)	U
34SO1050	34SO1050-02	11/02/98	LEAD (TOTAL)	U
34SO1050	34SO1050-02FD	11/02/98	LEAD (TOTAL)	U
34SO1050	34SO1050-02	11/02/98	ZINC (TOTAL)	U
34SO1050	34SO1050-02FD	11/02/98	ZINC (TOTAL)	U

U = Nondetect

Target VOCs were not detected in any TB sample submitted with the soil samples. Target organic compounds (VOCs or pesticides/PCBs) were not detected in any EB sample.

All EB samples collected with the soil samples had reportable concentrations of copper, lead and zinc. The levels of copper, lead and zinc in the EBs are likely attributable to the decontamination equipment rather than to crossover from native samples. In accordance with data review guidelines, results less than the established action levels for copper, lead and zinc in the field samples listed in Table 4-5 were qualified accordingly.

4.2.2 Field Duplicate Samples

Seven FD samples were collected and analyzed in order to evaluate field precision. Field duplicate samples were collected for VOCs, pesticides, PCBs, and metals analyses from locations 34SO1014, 34SO1023, 34SO1037, 34SO1044, 34SO1047, and 34SO1050; one sample was taken for pesticides/PCB and metals analyses from location 34SO1008.

FD results were evaluated during the data review process by comparing the native sample results to the duplicate sample results and calculating the relative percent

FD results were evaluated during the data review process by comparing the native sample results to the duplicate sample results and calculating the relative percent difference (RPD). If the RPD is greater than 50 percent, positive sample results above the RL in both the native sample and the field duplicate are qualified as estimated (coded J).

Detected VOC results for native and FD samples collected from locations 34SO1014 and 34SO1023 were comparable. VOCs were not detected in the native and FD samples collected from locations 34SO1037, 34SO1044, 34SO1047 and 35SO1050. Several analytes were detected in all native and FD samples; detected results greater than the RL exhibited excellent comparison. Only one native and FD sample had positive results for pesticides and PCBs. The native sample collected from location 34SO1008 was nondetect for pesticides and PCBs, but the FD sample collected from this location had positive results for the following pesticides and PCBs: dieldrin at 4.7 µg/L, endrin at 3.9 µg/L, 4,4'-DDD at 12 µg/L, α-chlordane at 7.8 µg/L, and Aroclor 1254 at 250 µg/L. The difference in results for this sample is likely due to matrix interferences. The native and FD results for these samples were qualified as estimated (J). Pesticides and PCBs were not detected in the native and FD samples collected from locations 34SO1014, 34SO1023, 34SO1037, 34SO1044, 34SO1047 and 35SO1050.

5.0 CORRECTIVE ACTION AND RESOLUTION

If necessary, the laboratory performed corrective actions affecting analytical data for this investigation. When required by the method or the MMR QPP, the laboratory reanalyzed samples that did not meet QC criteria. Resampling was not required for any of the field samples collected in this investigation.

6.0 CONCLUSIONS

Project goals for PARCC were met. All anticipated field samples and FD samples were collected in accordance with the MMR QPP and project work plan, and were submitted for the requested analyses. The percent completeness for each analysis is presented in Table 6-1.

TABLE 6-1
Percent Completeness Summary

Analysis	Percent Complete
VOCs	97
Pesticides/PCBs	100
8 RCRA Metals	100

Completeness goals were for all analyses. A total of 17 nondetected VOC data points were rejected (coded R) due to low IS area counts. These data are unusable due to the possibility of false negatives. The laboratory reanalyzed all samples with similar results, confirming matrix interference. The remaining results obtained from the VOC analyses yielded sufficient data to evaluate the presence or absence of contamination in this area. In general, the rejected data points are limited in scope, based on the sample matrix interference, and do not indicate a widespread trend reflecting poor laboratory performance.

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